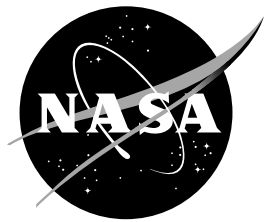


NASA Facts

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771
(301) 286-8955



FS-2002-2-038-GSFC

Goddard Space Flight Center Missions for 2002

*We revolutionize knowledge of the Earth and the Universe
through scientific discovery from space to enhance life on Earth.*

Goddard Space Flight Center's Mission

Goddard enables discovery through leadership in Earth and space science. We serve the scientific community, inspire the Nation, foster education and stimulate economic growth.

Goddard creates technologies that support and advance these endeavors, never compromising the safety of the public or our employees in the conduct of our work.

Introduction

We are committed to NASA's vision, as outlined by the Agency's Space Science and Earth Science Enterprises.

Join us for a brief look at the missions we have planned for 2002. With each new mission, Goddard continues the quest of advancing knowledge with new information, revolutionary technologies and educational outreach activities.

STS-109: The 11-day Hubble Space Telescope Servicing Mission 3B included five Extra Vehicular Activities (EVAs). Astronauts installed a new camera called the Advanced Camera for Surveys to increase the imaging capability of Hubble ten times over its current

ability. In addition, astronauts also installed a smaller, more powerful set of solar arrays, a new power control unit, a new reaction wheel assembly, and an experimental cooling system to reinvigorate Hubble's infrared vision.



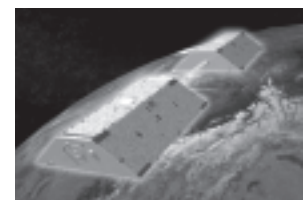
The Hubble Space Telescope.

The Space Shuttle Columbia launched in February from Kennedy Space Center, Fla.

Hubble is operated and managed by Goddard. For information about the Hubble Space Telescope, go to: <http://hubble.gsfc.nasa.gov/>

GRACE: The goal of NASA's Gravity Recovery and Climate Experiment (GRACE) mission is to map the Earth's gravity field more accurately than ever before.

GRACE is a scientific pathfinder mission that will test a novel approach to tracking how water is transported and stored within the Earth's environment. The data obtained from GRACE will provide vital measurements of the amount of ice in the polar regions, the quantity of water in underground aquifers, the direction of deep



Artist concept of GRACE on orbit.

ocean currents, and the exchange of water from the oceans into the atmosphere.

Gravity is a constant force and the Earth's mass remains relatively unchanged from day to day. However, the Earth's distribution of mass changes dramatically as ice melts, drinking water supplies drain, and large lakes unload their contents onto the land in the form of snow. A variety of complex changes to the Earth, its air, water and relationship to space could change in the Earth's gravity field.

Using two identical spacecraft, flying about 124 miles (200 kilometers) apart from each other, the GRACE spacecraft will orbit Earth, each being pulled by areas of higher or lower gravity. An onboard Global Positioning System will measure the changing distances between the spacecraft using microwave signals. From the measured relative motion of each spacecraft, scientists will be able to map the Earth's gravity field every 30 days throughout the five-year mission.

One of the feats GRACE will accomplish is measuring the snow and ice sheets covering Greenland and Antarctica and recording changes in their masses caused by melting or evaporation. The data, along with measurements from the ground and other satellites, will allow scientists to determine whether these areas are growing or shrinking in size. Such information is crucial to improving our understanding of the effects of climate change and sea level rise and its impact on society. The GRACE spacecraft also will make similar measurements of the oceans and the Earth's atmosphere.

GRACE launched in March 2002 aboard a rocket from Northern Russia.

For more information about GRACE, visit the following Websites:

<http://essp.gsfc.nasa.gov/grace/index.html>
<http://www.csr.utexas.edu/grace/mission/>

RHESSI: The satellite was recently re-named RHESSI - the Ramaty High-Energy Solar Spectroscopic Imager - in honor of the late NASA scientist who pioneered the fields of solar-flare physics, gamma-ray astronomy and cosmic ray research.



Artist concept of RHESSI studying solar flares.

Using an imaging spectrometer aboard the spacecraft, RHESSI is producing the first high-fidelity color movies of solar flares in their highest energy emissions, providing insight into what triggers the flares and how they explosively release energy.

X-rays that reach Earth can change the structure of its electrified upper atmosphere, or ionosphere. This sort of intense energy release can interfere with spacecraft electrical systems and their orbits, and can affect astronaut activities.

Analyzing and predicting solar flare activity is important as our society becomes increasingly dependent upon advanced technology in support of our day-to-day activities.

RHESSI is the sixth Small Explorer mission and the first being managed in the 'principal investigator' mode. The University of Berkeley (Calif.) is responsible for most aspects of the mission, including instrument and spacecraft development, mission operations and data analysis.

Goddard's Explorer Program Office provides program management and technical oversight for the RHESSI mission.

RHESSI launched aboard a Pegasus rocket in February from Cape Canaveral Air Force Station, Fla.

For more information, go to:
<http://hesperia.gsfc.nasa.gov/hessi/>

TDRS-I and -J: The second of three advanced Tracking and Data Relay Satellites, TDRS-I launched in March from Cape Canaveral Air Force Station, Fla., aboard an Atlas IIA rocket.

The last in this new series, TDRS-J, is scheduled to launch this fall from Cape Canaveral Air Force Station, Fla. aboard an Atlas IIA rocket.

Together, the three new TDRS will support NASA and its user satellite community's tracking and communications needs well into the 21st century. TDRS-H (accepted by NASA in October 2001 and now called TDRS-8), -I and -J are fully compatible with the existing on-orbit fleet of six TDRS.

Since the first TDRS launched in 1983, the System has provided unsurpassed tracking and data acquisition services between low Earth orbiting spacecraft and NASA/customer control and/or data processing facilities.

Enhancements include: a new Multiple-Access system can support up to five user spacecraft and at much higher data rates than the original TDRS.



Artist concept of TDRS-I in foreground.

Two Ku-band Single Access antennas, operating from 13.7 GigaHertz to 15.0 GigaHertz, provide higher bandwidth for user satellites, offering high-resolution digital television for

Space Shuttle communications; and also can transfer enormous volumes of data at rates which are 5,000 times faster than the standard 56K home-computer modem.

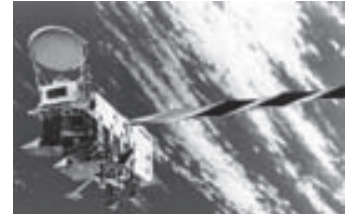
A new higher-frequency Ka-band Single Access service will provide enhanced communications with future missions that require higher bandwidths, such as multi-spectral instruments for Earth science applications.

For more information about TDRS-8, -I and -J,

go to: <http://tdrs.gsfc.nasa.gov/Tdrsproject/>

Aqua (EOS-PM): The Earth Observing System Aqua mission will help provide some important answers to questions surrounding global change.

Flying in an orbit that covers the globe once every 16 days, Aqua will develop a six-year chronology of our planet and its processes.



Artist concept of Aqua spacecraft on orbit.

Comprehensive measurements taken by the spacecraft's onboard instruments will allow scientists to assess long-term climate change, identify its human and natural causes and advance the development of models for long-term forecasting.

Aqua is scheduled to launch in May from Vandenberg Air Force Base, Calif., aboard a Delta II rocket.

For more information about Aqua, go to: <http://aqua.nasa.gov/>

NOAA-M: NASA and the National Oceanic and Atmospheric Administration (NOAA) have jointly developed a valuable series of Polar-orbiting Operational Earth Observation Satellites (POES), the first of which launched in 1978.

NOAA-M is the latest in this series, which will continue to provide a polar-orbiting platform to support environmental monitoring used for imaging and measuring the Earth's atmosphere, its surface and cloud cover.

In many developing countries and over most of the oceans, satellite data are the only source of quantitative information about the state of the atmosphere and of the Earth's surface. The series of NOAA satellites is an invaluable source of real-time data about severe weather,

which is critical for the safety of people living in these remote areas.



Artist concept of NOAA-M spacecraft on orbit around Earth.

The satellites also support an international search and rescue program, which, since 1982, has been credited with saving more than 11,000 lives

by detecting and locating emergency beacons from ships, aircraft and people in distress.

NOAA-M is scheduled to launch in June from Vandenberg Air Force Base, Calif., aboard a Titan II rocket.

For more information about this mission, go to: http://www.earth.nasa.gov/missions/ref_web/mnoaam.htm

CONTOUR: Comets are by far the most numerous and sizeable bodies in the solar system, numbering more than a million million. The Comet Nucleus Tour (CONTOUR) spacecraft will visit and study at least two of these celestial bodies - comets Encke and Schwassmann-Wachmann 3.



Artist concept of the CONTOUR spacecraft.

Scientists study comets because they may have brought to our forming Earth some of the water in the oceans, gases in our atmosphere and perhaps even the life-generating molecules from which we evolved.

At the heart of every comet lies its nucleus - a tiny, irregular chunk of ice and rock. When a comet approaches the Sun, its surface heats up, evaporating ice and releasing gases and dust that form the atmosphere, or coma.

While comas and tails are large enough to study

from the ground, a comet's nucleus can only be studied up close. Protected by its dust shield, CONTOUR will fly by each comet at a distance of about 60 miles (100 kilometers) and while each comet is close to the Sun, collecting data for scientists back on the ground.

Goddard has one instrument aboard the spacecraft - The Neutral Gas and Ion Mass Spectrometer - which will measure the abundance and isotope ratios for many neutral and ion species in the coma of each comet during the flyby.

These measurements, together with data from the dust experiment, will contribute to a better understanding of the chemical composition of the nucleus itself and allow differences between the comets to be studied.

CONTOUR is one of eight NASA Discovery Program missions that are providing scientists with opportunities to find innovative ways to unlock the mysteries of the universe.

The Johns Hopkins University Applied Physics Laboratory in Laurel, Md. manages the CONTOUR mission for NASA.

CONTOUR is scheduled to launch in July from Cape Canaveral Air Force Station, Fla. aboard a Delta II rocket.

For more information about the mission, go to: www.contour2002.org/

STS-107: This 111th Space Shuttle mission, scheduled to lift off in July from Kennedy Space Center, Fla., will carry two GSFC payloads - the Student Experiment Module-14 (SEM) and a Hitchhiker called 'FREESTAR.' Goddard provides operational support and safety assurance for each of these payloads.

SEM-14 is an educational initiative that allows students to fly simple experiments aboard the Shuttle, becoming involved in space flight and research. SEM-14 is managed by the Shuttle Small Payloads Office at Goddard's Wallops

Flight Facility, Va.

The Fast Reaction Experiments Enabling Science Technology Applications and Research (FREESTAR) Hitchhiker contains five experiments - MEIDEX, LPT, SOLCON-3, SOLSE-2 and CVX-2.

MEIDEX will aid in long-term weather and climate forecasting.



Space Shuttle on the launch pad at KSC.

LPT is a low-power, lightweight, low-cost navigation and communications transceiver prototype, jointly developed by Goddard and ITT Industries.

SOLCON-3 will measure the solar constant, identifying variations during a solar cycle. The data will help scientists better understand global climate change.

SOLSE-2 will demonstrate the technique of using light scattered from the Earth's atmosphere to measure ozone, helping to improve the next generation ozone monitoring capability.

CVX-2 will rapidly stir xenon, one of nature's simplest fluids, and measure the response to aid in predicting the flow of new plastics.

For more information about FREESTAR, go to: http://sspp.gsfc.nasa.gov/hh/freestar/experiments_page.html

GALEX: The Galaxy Evolution Explorer (GALEX) is a revolutionary mission that will map the history of star formation and galaxy evolution in the universe.

At the dawn of cosmic history, approximately 10 to 15 billion years ago, immense swarms of

stars - the first galaxies - took shape from vast clouds of primordial elements.

The nuclear furnace of stars forged these primordial elements into life-sustaining ones, such as carbon and oxygen. Life's elements were blasted into space when dying stars exploded, only to condense anew into stars like our Sun and planets like Earth.



Engineers working on the GALEX spacecraft prior to launch.

GALEX will use its telescope as a time machine, since light takes significant time to travel the immense distances of the cosmos. For example, the Andromeda galaxy is the closest galaxy similar to our own Milky Way, but we see it as it existed about two million years ago, because light from Andromeda, just now reaching our telescopes, took about two million years to traverse the void between us.

Since most galaxies are much farther than Andromeda, GALEX will survey many galaxies at different distances to build a history of star formation and galactic evolution.

GALEX will produce the first ultraviolet all-sky survey and the first ultraviolet wide-area spectroscopic survey. These rich trove of data are expected to provide new discoveries for many years after the 27-month long mission is complete.

GALEX is scheduled for launch in July aboard a Pegasus XL rocket from Cape Canaveral Air Force Station, Fla.

Goddard's Explorers Program Office manages the GALEX mission.

For more information, go to: <http://www.srl.caltech.edu/galex/>

INTEGRAL: The International Gamma-Ray Astrophysics Laboratory (INTEGRAL) is a joint NASA/European Space Agency (ESA) mission that will provide new understanding of objects and processes, which emit the most powerful electromagnetic radiation.

During the sudden death of a star in a supernova explosion, radioactive elements are formed and ejected into space, emitting gamma rays with recognizable energies. Observations of the gamma-ray lines provide scientists with the most direct method of studying the formation of elements, such as nucleosynthesis in the Universe.



INTEGRAL spacecraft
Credit: ESA.

Orbiting the Earth once every three days, INTEGRAL will spend most of its time at an altitude higher than 24,852 miles (40,000 kilometers), well outside the Earth's radiation belts, in order to avoid background radiation effects. From this vantage point, the gamma-ray observatory will send back new information about exciting phenomena in the Universe, such as violent explosions, the formation of elements, black holes and other exotic objects in our Milky Way, the cosmic neighborhood and much farther, in distant galaxies at the edge of the observable Universe.

Goddard manages the U.S. Guest Observer Program for this mission, which involves archiving and supporting the use of X-ray and Gamma ray astronomy data by the astrophysics community.

Goddard also supplied the software for analyzing data produced by the spacecraft's spectrometer.

INTEGRAL is scheduled to launch in November aboard a Proton rocket from Baikonur, Kazakhstan. For more information about the mission, go to: <http://sci.esa.int/home/integral/index.cfm>

SORCE: The Solar Radiation and Climate Experiment (SORCE) will provide scientists with precise measurements of solar radiation, specifically addressing long-term climate change, natural variability and enhanced climate prediction, and atmospheric ozone and ultraviolet-B radiation.

Such measurements are critical to studies of the Sun, its effect on our Earth system and its influence on humankind.

SORCE is scheduled to launch in December aboard a Pegasus XL rocket from Cape Canaveral Air Force Station, Fla. Goddard's Earth Observing System Program Office manages the mission.

The University of Colorado's Laboratory for Atmospheric and Space Physics, Boulder, is responsible for most aspects of the mission, including the instruments, spacecraft, and mission and science operations.



Artist concept of the SORCE spacecraft.

For more information about SORCE, go to: http://www.earth.nasa.gov/missions/ref_web/msorce.htm

CHIPSat: CHIPSat is the first NASA University Explorers satellite. A Cosmic Hot Interstellar Plasma Spectrometer aboard the spacecraft will examine the interstellar medium, the gas that fills space between the stars.

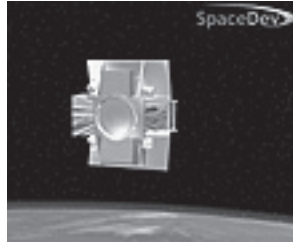
Just as raindrops split sunlight into the colors of the rainbow, the CHIPS instrument will collect and separate the diffuse extreme ultraviolet glow from the interstellar medium.

By measuring the distribution and intensity of the glow, scientists will be able to test several competing theories about the formation of the

clouds of hot interstellar gas that surround our solar system.

Partners in this effort include Goddard's Wallops Flight Facility, the University of California, Berkeley, and SpaceDev of Poway, Calif.

Because of far-reaching effects of the hot interstellar medium in shaping the structure of spiral galaxies, CHIPSat not only supports NASA's Structure and Evolution of the Universe theme, but also NASA's Origins theme because of its star formation connection.



*Artist concept of the CHIPSat spacecraft.
Image credit: SpaceDev.*

The University of California, Berkeley is the principal investigator institution and provides overall mission management for NASA.

For more information about this mission, go to: http://cse.ssl.berkeley.edu/chips_epo/welcome.html

ICESat: The Ice, Cloud, and Land Elevation Satellite is a benchmark mission, which will achieve the Earth Systems Enterprise/Earth Observing Systems' requirements for measuring ice sheet mass balance, cloud and aerosol heights, optical densities, vegetation and land topography.

ICESat will provide scientists with vital information about cloud properties, which are not otherwise available from passive sensors, especially high ice clouds that are common over polar areas.



Artist concept of the ICESat spacecraft.

Onboard instruments will produce a land-topography data set by processing the altimeter data throughout its orbit, in addition to the polar coverage over ice sheets.

The mission will attempt to answer such puzzling questions as:

- Is the sea level rising?
- Are the Greenland and Antarctic ice sheets growing or shrinking?
- Can ice sheets cause large, rapid changes in sea level?
- Will the ice sheets melt or grow in a warmer climate?

ICESat is co-manifested with CHIPSat. Launch is scheduled for December from Vandenberg Air Force Base, Calif., aboard a Delta II rocket.

For more information about the ICESat mission, go to: <http://icesat.gsfc.nasa.gov/>